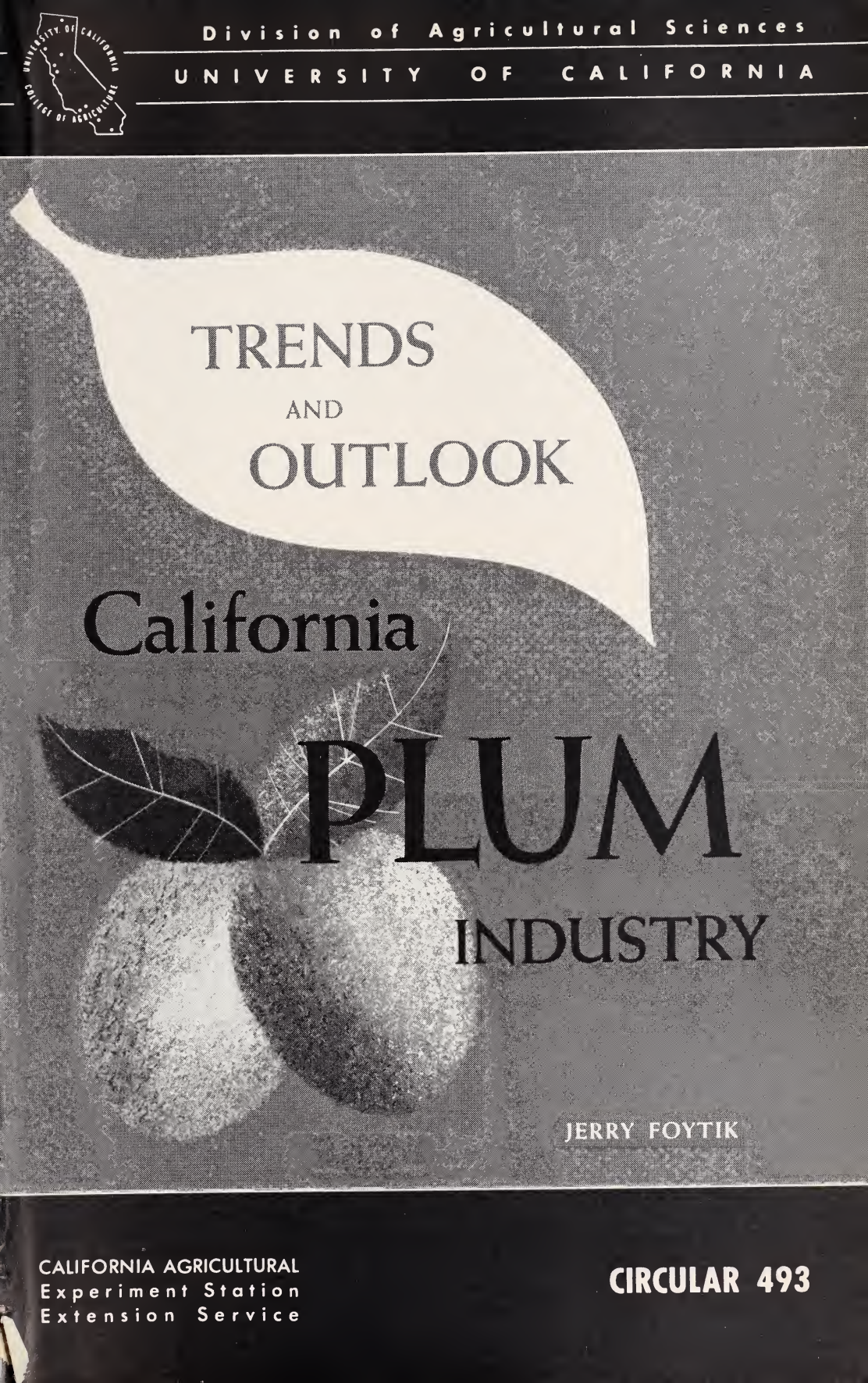
Division of Agricultural Sciences
UNIVERSITY OF CALIFORNIA

TRENDS AND OUTLOOK

California PLUM INDUSTRY



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CALIFORNIA AGRICULTURAL
Experiment Station
Extension Service

CIRCULAR 493

The California plum industry has undergone important changes during the past decades. Some of these changes are shown in the graph below.

This circular examines the factors responsible for the changes and evaluates the situation. By considering past shifts and present trends it projects the outlook for questions important to growers and handlers of plums. Among those questions are the following:

¶ Will past shifts in geographical location, varietal composition, and age distribution of plum acreage continue?

¶ Will the present trend toward higher yields extend into the future?

¶ Will it pay to plant additional acreage to plums? If so, what varieties will be most profitable?

¶ Has the industry's marketing agreement program improved returns to growers or has it run its course?

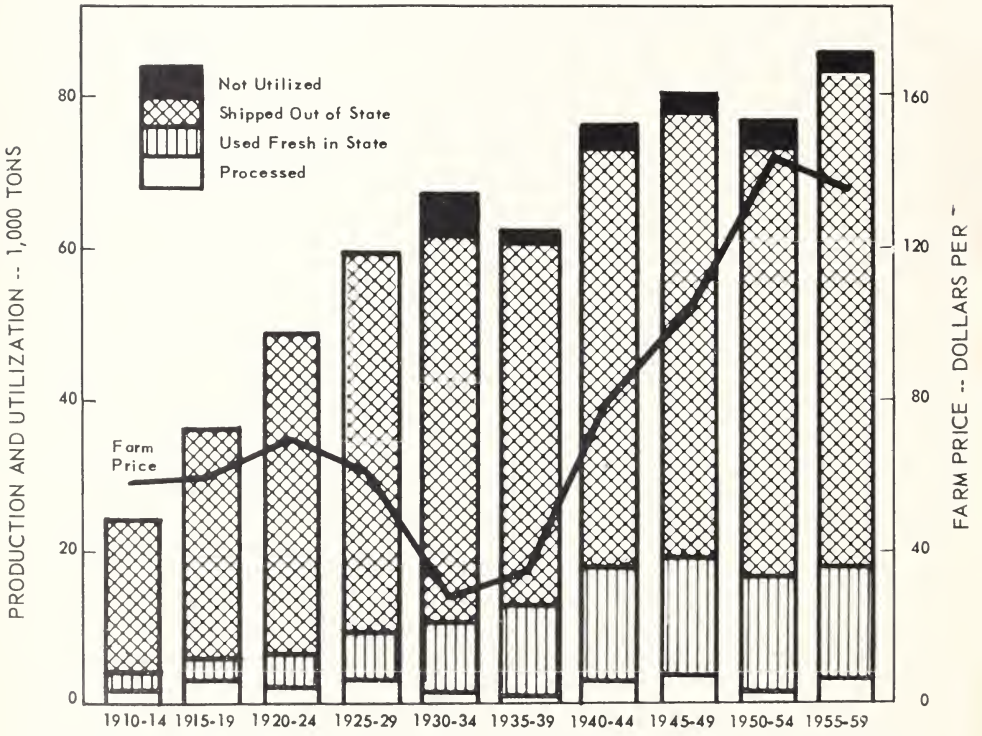


Figure 1. California Plums: Production, Utilization and Farm Price. Five-year Averages, 1910–59.

IN SHORT . . .

Production

of plums leveled off at an average of 81,000 tons since 1945. During the past fifteen years production reached 100,000 tons in three seasons and fell below 70,000 tons three times. The substantial increase during 1920 to 1945 was due primarily to an expansion in bearing acreage followed by an increase in yield.

Acreage expanded rapidly until 1932, declined sharply during the next decade, and increased slightly since the early 1940's. The composition of varieties, location, and age of acreage has changed considerably.

Yield varied about a level of 2.2 tons per bearing acre until 1935, then increased to the present average of almost 4 tons.

OUTLOOK:

some production increase for the next several years. Bearing acreage should rise above the present relatively low level. A further yield increase appears likely if present good cultural practices are not abandoned.

Marketings

of plums average 96 per cent in fresh form. One-fifth of the fresh plums are sold within California, four-fifths are shipped to out-of-state markets. The different varieties are marketed in a staggered fashion throughout the season (May to September) as they mature. During the past quarter century sales of the four major varieties have expanded from one-half to three-fourths of the total. Processing of plums is limited to small quantities canned and frozen. A marketing control program has been used extensively and successfully to raise minimum grade and size of plums shipped to fresh markets.

OUTLOOK:

continuation of the present utilization pattern. Processing is not likely to expand or decline significantly. Local and interstate fresh sales are expected to continue at present relative amounts.

Farm Prices

of plums increased gradually from a depression low of $25 per ton in 1931–33 to $50 by 1941, then rose rapidly to the average of $150 maintained since 1950. Until 1950 growers received considerably less from local fresh sales than from interstate shipment. Since then the two prices have been approximately equal. Farm prices for plums sold to processors are far below those realized from fresh sales.

OUTLOOK:

maintenance or gradual rise of the present level of farm prices if consumer purchasing power continues to climb near the recent rate. The prospective production increase should not depress farm prices unduly except in years of bumper crops.

THE CALIFORNIA PLUM INDUSTRY

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WHAT IS A PLUM?

Originally the terms "plum" and "prune" were used interchangeably for the fruit of many hundred varieties comprising some 15 different species. A distinction in meaning evolved gradually, is currently recognized by the industry, and will be used throughout this circular.

Prune designates a variety which can be and normally is sun-dried without removal of the pit. The term refers to both the fruit in its fresh state and to the dried product.

Plum specifies a variety grown primarily for uses other than drying—mainly for fresh consumption but also, to a limited extent, for canning, freezing, crushing, and jam- and jelly-making. Most, though not all, of the plum varieties will ferment when sun-dried with the pit. If they are dried after removal of the pit, the product is called "dried plums" and not "prunes."

Fresh prunes, which are grown extensively in the Pacific Northwest, fit into neither of the above categories. They are varieties equally well-suited and widely utilized for fresh use, canning and drying. In recent years the Northwest industry has tried to gain widespread use of "purple plums" as a more appropriate name.

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JANUARY, 1961

CALIFORNIA PLUM INDUSTRY TRENDS AND OUTLOOK

JERRY FOYTIK

California is the leading plum producing state. Commercial production in the United States is confined principally to a few specialized growing areas in California. Some 15 to 20 varieties are of major importance.

California plums are sold chiefly for fresh consumption, mainly in the heavily populated industrial region of the north central and northeastern states, and in local California markets. Plums account for 25 per cent of the fresh deciduous fruits shipped from the state—and 40 per cent of shipments during the early summer period, May to July. They are marketed in a staggered fashion from May to September as the different varieties mature. Most varieties occupy the center of the marketing stage for only two or three weeks, sometimes even less.

Growing Conditions

Although plums are not particularly sensitive to soil and climatic conditions, they make their best growth and produce heavier yields when grown on rather deep, fertile, well-drained loam or clay-loam soils. The long, dry summers in the interior valleys are well suited to the proper development and early ripening of plums if enough irrigation water is available to supplement the rainfall. When late spring frosts occur blossoms of early varieties may be damaged seriously. Hence, plantings in the foothill regions are largely confined to the later-blooming varieties or to lower elevations.

Selection of good pollinators, especially varieties which are themselves profitable, is important. Preventive control of diseases and insect pests attacking the tree, foliage, and fruit, is necessary although these remedies are expensive.

Varietal Characteristics

Plum varieties show differences, sometimes quite marked, in appearance, palatability, marketability, tree growth, and productiveness. These differences have a direct and pronounced effect upon the economic, as well as the technological, aspects of producing and marketing plums.

California plums grown for fresh shipment are primarily either of the European group (*Prunus domestica*) or of the Japanese group (*Prunus salicina*). In addition, there are hybrids of the latter with other species.

Japanese varieties (including hybrids) typically are medium to large; flat, round, or heart-shaped; red or crimson, never blue or purple; and very juicy. Many ripen early and can be marketed before the main avalanche of summer fruits arrives. They must be handled carefully and promptly between harvest in the orchards and delivery at retail stores because they tend to bruise easily.

European varieties generally are smaller; oval or roundish; and blue or purple. Compared to Japanese varieties,

most European plums are milder, especially those shipped late in the season, and have a firmer texture. They may be allowed to nearly ripen on the tree and still arrive at distant markets in good condition. European varieties bloom later in the season when danger from frost damage is less but they ripen when competition from other deciduous fruits is greater.

Many Japanese varieties are self-unfruitful. Sometimes self-fruitful varieties are cross-pollinated to increase yields. Usually European varieties are self-fertile and do not require cross-pollination for securing good crops. However, they are less productive than Japanese varieties. They start bearing and reach full maturity at a later age.

Some 2,000 varieties have been grown successfully in the United States. Only a relatively few, however, are of commercial importance in California and other states. Most varieties are no longer grown or are planted on a limited scale in home gardens and for supplying local markets.

Canning is limited largely to certain European varieties (especially Jefferson, Washington, and Yellow Egg), which are not produced for fresh shipment to eastern markets. These varieties are usually large, green or yellow.

ACREAGE HAS UNDERGONE FREQUENT CHANGES

As a result of changes in geographic location, varietal composition and age distribution in acreage, California's plum industry has changed considerably in the past, is changing at present, and can be expected to change further in the future. Numerous varieties have been grown successfully in most fruit-producing areas of the state. However, because of climate and other factors, commercial production is restricted to some 15 or 20 varieties grown in the interior valleys and foothills of central California.

VARIETAL GROUPS BY SEASON

Plum varieties are classified into three major groups, according to their marketing periods. The following classification lists varieties in approximate order of peak sales:

Early Plums (sold on eastern markets up to about July 15) include six varieties: Star Rosa, Beauty, Burmosa, Formosa, Santa Rosa, and Climax.

Midseason Plums (sold chiefly between July 15 and August 10) include nine varieties: Tragedy, Burbank, Wickson, Eldorado, Becky Smith, Gaviota, Sugar, Duarte, and Diamond.

Late Plums (sold primarily after August 10) include 13 varieties: Late Tragedy, Laroda, Ace, Sharkey, Emily, Late Santa Rosa, Giant, Standard, Grand Duke, Kelsey, Gros Hungarian, President, and Late Duarte.

Minor Varieties are all others, including canning plums sold fresh. Their combined sales are less than 1 per cent of the total. They are sold throughout the plum season.

NOTE: Some varieties of little present importance are included in the main groups because of their former significance in fresh shipment. The industry considers the Sugar variety as a plum or a prune according to whether the fruit is shipped fresh or dried. This meaning is followed here although it somewhat contradicts the definitions given on page 4.

Acreage Trends

During the past 40 years bearing acreage increased one-third—from 17,000 in 1919 to 21,800 in 1959—and total acreage one-fourth. This expansion, however, was not uniform throughout the period, nor among districts and varieties. For example, bearing acreage almost doubled during 1919–29 (to a peak of 31,500), and then declined to 23,400 in 1941. Changes since have been minor. In 1940–59 bearing acreage varied between 21,100 and 24,300. This level is about 25 per cent below the 1929 peak.

During the large reduction, mainly between 1929 and 1941, usually trees of less productive varieties were removed, particularly in the older plum-growing districts. New plantings were made of profitable varieties, especially in areas of higher yields.

Shifts in location, varieties, and age composition of California's plum acreage are discussed here in some detail, with emphasis on the twenty-year period 1936–56.

Shifts in Location

Commercial acreage of California plums is concentrated in a few counties, forming three major producing areas (see box below). These three areas represent 92 per cent of the total plum acreage: 55 per cent in South San Joaquin District, 25 per cent in Placer District, and 12 per cent in Sacramento District.

Tulare, Fresno, and Kern counties represent 97 per cent of the South San Joaquin acreage. The other three counties declined from 10 to 3 per cent of the six-county total since the mid-1920's. Almost 99 per cent of Placer District's acreage is in Placer County, the rest in El Dorado and Nevada counties. Only two other counties (Amador and Calaveras) ever had any appreciable acreage. Their combined acreage reached a peak of 325 (3.7 per cent of the district total) in 1921, declined sharply during the 1930's and disappeared completely a few years ago.

Sacramento District includes several separate sub-areas. Sacramento, Solano,

PLUM PRODUCTION DISTRICTS

Counties for each district are listed in decreasing order of present acreage

South San Joaquin District *includes six counties of the southern portion of the interior valleys: Tulare, Fresno, Kern, Madera, Kings, and Merced. This district corresponds approximately to the fruit-growing areas of four districts (Kern, Tulare, Fresno, and Stanislaus) established by the California Tree Fruit Agreement.*

Sacramento District *contains the seven valley counties immediately to the north of those listed above: Sutter, San Joaquin, Yuba, Solano, Sacramento, Stanislaus, and Yolo. These counties approximate CTFA districts of Sutter, Sacramento River, Vacaville, and Lodi.*

Placer District *is composed of the 11 foothill counties included in Crop Reporting District No. 6: Placer, El Dorado, and Nevada, plus eight counties currently without any commercial acreage (Alpine, Amador, Calaveras, Inyo, Mariposa, Mono, Sierra, and Tuolumne). This district corresponds to El Dorado, Colfax and Placer districts of CTFA.*

Other Areas *include eight counties in southern California, 12 along the central coast, and 13 in the northern portion of the state.*

and Yolo counties reached a peak acreage of 9,300 in 1925 (76 per cent of the district total) and then declined rapidly to less than 500 acres at present. Acreage also decreased in San Joaquin and Stanislaus counties, but at a later date and slower rate. In Sutter and Yuba counties acreage expanded three-fold during the past twenty years. At present 86 per cent of the district's acreage is in four counties: San Joaquin, Solano, Sutter, and Yuba—compared to 24 per cent in 1925.

There have been important shifts among districts. Major acreage changes since 1921 are shown in figure 2. Bearing acreage increased in each district until about 1931. In South San Joaquin, following a temporary reduction during the early 1930's, a further expansion occurred. Acreage declined elsewhere in the state during the past 25 to 30 years: from 10,000 to 7,500 acres in Placer District, 10,000 to 2,200 in Sacramento District, and 3,200 to 1,700 in other counties. Expressed in percentages of the total bearing acreage, South San Joaquin increased from 12 to 53 per cent between 1921 and 1959. Bearing acreage decreased elsewhere in the state during this period: from 38 to 29 per cent in Placer District, 39 to 10 per cent in Sacramento District, and from 11 to 8 per cent in other counties.

Shifts in Plum Varieties

In their attempt to find better adapted varieties, to increase yield, and to recognize buyer preferences, producers con-

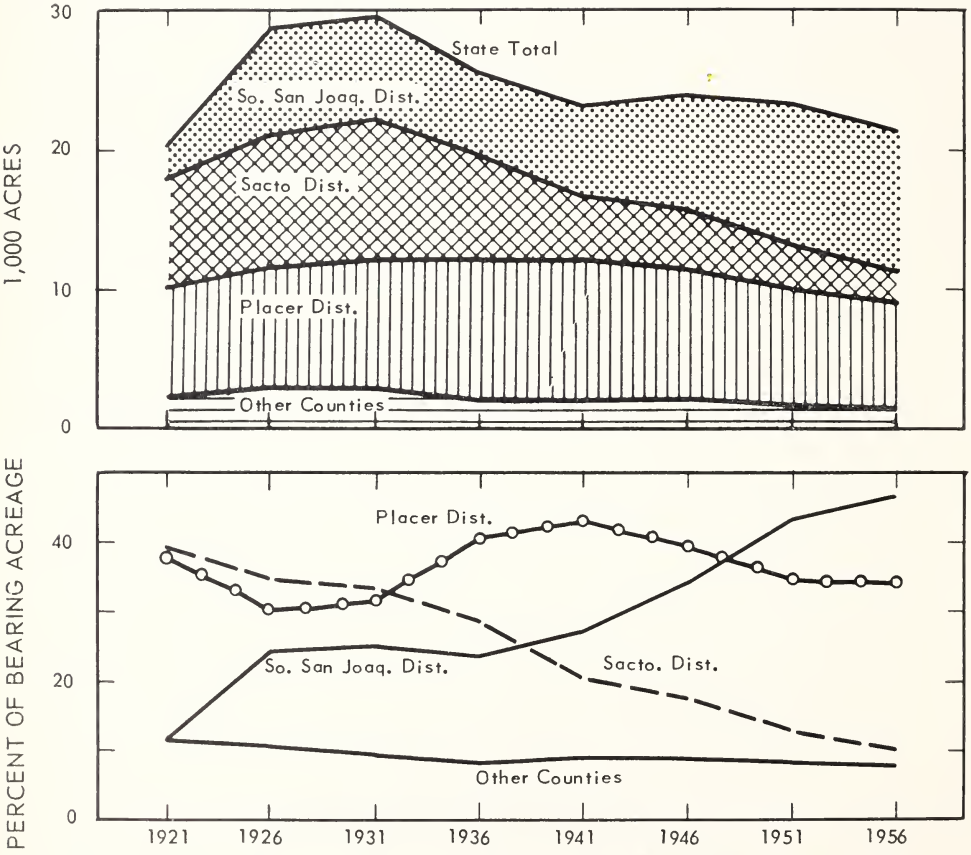


FIGURE 2. DISTRIBUTION OF BEARING ACREAGE, BY MAJOR PLUM DISTRICTS, 1921–56.

Table 1. Acreage of California Plums,* 1936, 1956, and 1959

Variety	State total			So. San Joaquin		Other districts	
	1936	1956	1959	1936	1956	1936	1956
	Acres (total bearing and nonbearing)						
Santa Rosa	5,080	10,130	11,750	2,590	7,130	2,490	3,000
Duarte	1,900	3,810	3,260	90	620	1,810	3,190
Subtotal	6,980	13,940	15,010	2,680	7,750	4,300	6,190
Beauty	3,390	2,600	2,320	1,070	1,970	2,320	630
President	2,830	1,880	1,640	200	550	2,630	1,330
Subtotal	6,220	4,480	3,960	1,270	2,520	4,950	1,960
Burmosa, Laroda, Nubiana, and Queen Ann	0	1,600	3,140	0	†	0	†
Burbank, Climax, Grand Duke, Kelsey, Tragedy and Wickson	9,120	2,690	2,420	1,890	670	7,230	2,020
Other varieties	5,640	4,860	4,800	680	3,100	4,960	3,360
Subtotal	14,760	9,150	10,360	2,570	3,770	12,190	5,380
All varieties	27,960	27,570	29,330	6,520	14,040	21,440	13,530

* Does not incorporate recent revisions in acreage data made by the California Crop and Livestock Reporting Service since only state totals were changed—and not substantially. Estimates of 1956 acreage made for some varieties.

† Included with other varieties.

stantly alter the varietal composition of their acreage. Between 1936 and 1959 total acreage (bearing and nonbearing) increased sharply for the two leading varieties—130 per cent for Santa Rosa and 70 per cent for Duarte—and decreased for the next two varieties—30 per cent for Beauty and 40 per cent for President. Several new varieties were introduced. The four most popular ones (Burmosa, Laroda, Nubiana and Queen Ann) now account for 3,140 acres. Acreage declined 75 per cent for six varieties going out of production (see list in table 1) and 15 per cent for minor varieties.

As a result, the relative importance of varieties shifted since 1936. Santa Rosa and Duarte increased from 25 to 51 per cent of the total, and the four recent introductions from 0 to 11 per cent. On the other hand, President and Duarte decreased from 22 to 14 per cent, and other varieties from 53 to 24 per cent.

These changes occurred at different rates among districts. For example, acreage about tripled for Santa Rosa and doubled for Beauty in South San Joaquin, compared to an increase of 20 per cent for Santa Rosa and a decrease of 75 per cent for Beauty in the remainder of the state. A more detailed comparison, for the period 1936–56, is given in table 1.

If acreage changes for varietal groups are considered, a somewhat different comparison emerges. Figure 3 reveals

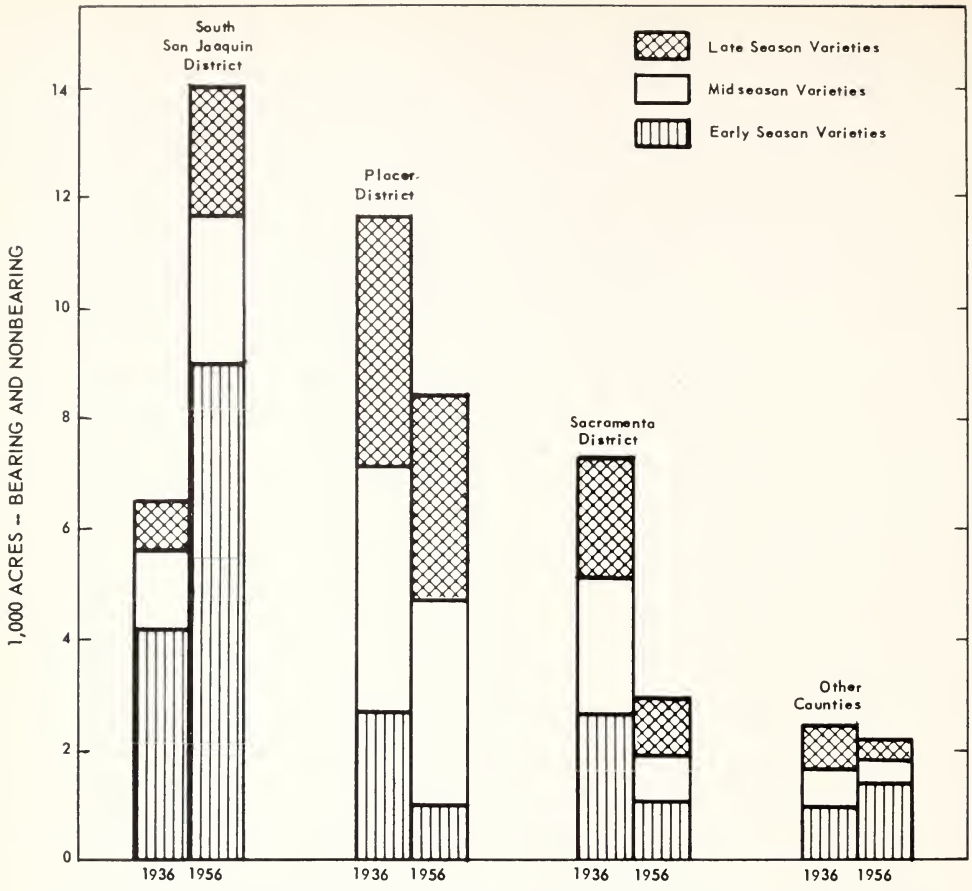


FIGURE 3. PLUM VARIETY GROUPS, ACREAGE, BY MAJOR DISTRICTS, 1936 AND 1956.

that within each major district similar changes occurred during 1936–56 for each group. The proportions of the total acreage consisting of early varieties continued at about 64, 20 and 37 per cent in South San Joaquin, Placer and Sacramento districts. The distribution of acreage was about 20, 38 and 30 per cent, respectively, in the three districts for midseason plums and 16, 42 and 33 per cent for late varieties in 1956 as well as twenty years earlier.

Shifts in Age Distribution

Although the total acreage in 1956 was equal to that of 1936, its age composition was changed. Nonbearing acreage doubled from 3,000 to 6,000 acres. Young bearing trees (sixteen years or less since planting) declined 25 per cent from 16,000 to 12,000 acres. Old acreage increased slightly. The geographic location must also be considered (see figure 4, next page). Several important changes occurred:

¶ Nonbearing acreage increased fourfold in South San Joaquin and continued at 2,100 acres for the remainder of the state. As a result, this district now has 65 per cent of the state's nonbearing acreage compared to 30 per cent in 1936.

¶ A similar shift occurred in young bearing trees. South San Joaquin's share rose from 29 to 60 per cent of the state total, while Placer and Sac-

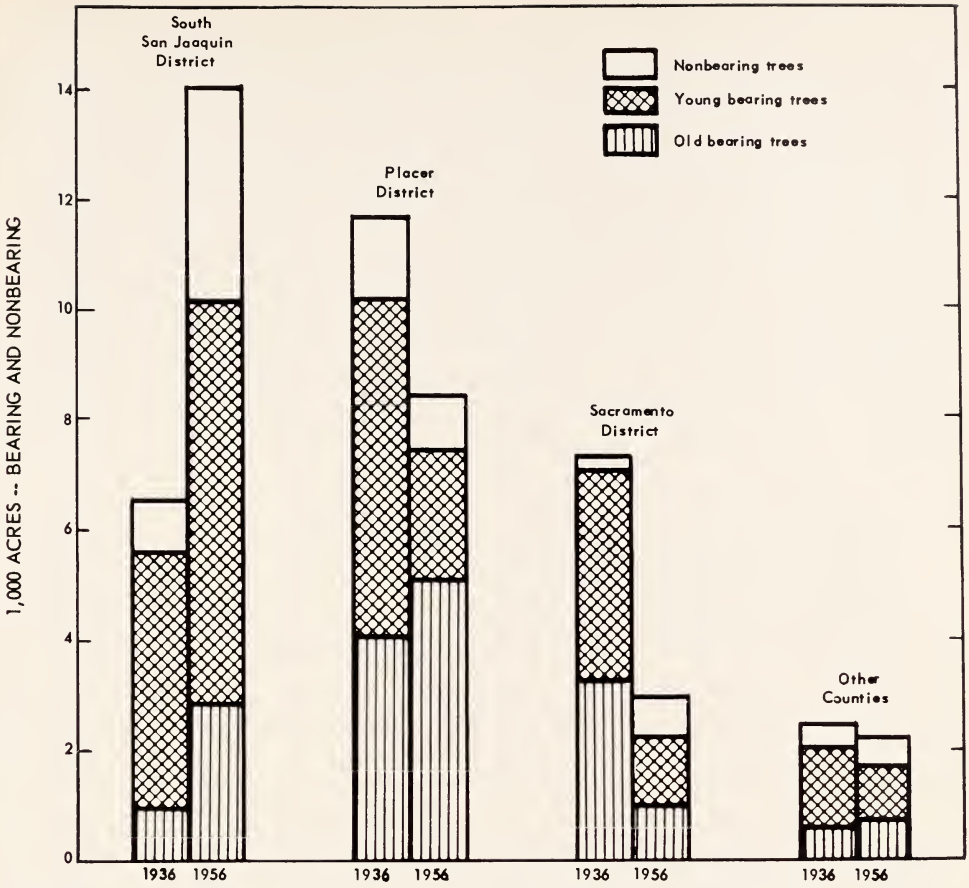


FIGURE 4. AGE CLASSIFICATION, ACREAGE, BY MAJOR DISTRICTS, 1936 AND 1956.

ramento districts declined from 38 to 20 per cent and 24 to 10 per cent.

¶ Trees have become relatively old in Placer District. The proportion of the district's acreage consisting of old trees increased from 35 to 60 per cent compared to a decline from 30 to 23 per cent for the balance of the state.

The proportion of nonbearing trees declined during the late 1920's to an average of 13 per cent for 1930–39. Nonbearing acreage reached a postdepression peak of 6,300 (21 per cent of total acreage) in 1947 and then declined sharply to 3,200 (13 per cent) in 1953. The recent increase raised the level to a new peak of 6,900 (25 per cent) in 1958.

Future Shifts

Estimates of future changes in bearing acreage are guided by recent plantings and by probable removals of older or diseased and weakened trees. Such forecasts can be reasonably accurate for the period immediately ahead.

In 1959 there were 7,580 acres of nonbearing trees. These will come into bearing by 1963. Removals from production over the next four years, of course, are not known. Estimates are difficult to make. The extent of removals depends primarily upon the age composition of present acreage. However, other influences are also relevant and their impact cannot be measured accurately.

Changes in bearing acreage since 1923

Table 2. Changes in Bearing Acreage of California Plums

Period	Beginning of period	Addition*	Apparent removal		End of period
			Acres†	Per cent‡	
1923–27	22,980	9,610	2,670	11.6	29,920
1927–31	29,920	4,800	4,760	15.9	29,960
1931–35	29,960	3,870	7,400	24.7	26,430
1935–39	26,430	4,170	5,910	22.4	24,690
1939–43	24,690	3,340	4,280	17.3	23,750
1943–47	23,750	4,170	3,820	16.1	24,100
1947–51	24,100	6,300	6,940	28.8	23,460
1951–55	23,460	3,620	5,990	25.5	21,090
1955–59	21,090	4,980	4,310	20.4	21,760
1959–63	21,760	7,580		...	
4-year average		5,244	5,120	20.3	

* Trees of nonbearing age at beginning of four-year period.
† Difference between bearing acreage at beginning of period plus additions (col. 1 and 2) and at end of period (col. 5).
‡ Per cent of bearing acreage at beginning of period.

Table 3. Age Distribution of California Plum Bearing Acreage

Tree age	1943	1948	1953	1958
	Per cent of bearing acreage			
4–8	15.1	21.7	26.7	23.1
9–13	16.0	12.7	22.0	22.9
14–18	18.1	11.6	12.0	18.1
19–23	50.8	15.4	9.8	35.9
24 and over		38.6	29.5	

are shown in table 2. During this period, about 5,120 acres were removed from production each four years. If this rate is continued, there will be a net gain of almost 2,500 bearing acres by 1963 since 7,580 acres of new trees will some into bearing.

Table 3 gives the age distribution of bearing acreage for recent years. Compared to the 1940's there are relatively more young trees, four to thirteen years of age, and substantially fewer old trees, nineteen years and older. This suggests that removals may be lighter than usual during the next few years. In this event, bearing acreage would continue its present upward trend for the immediate future and reach a level of almost 25,000 bearing acres by 1963 compared to an average of 21,600 for 1955–59.

YIELD FLUCTUATES BUT TREND IS UPWARD

For a particular year the yield depends primarily on the weather conditions during the blooming, growing, and harvesting season. Long-range yield trends, how-

ever, are guided by other forces. Cultural practices alter yield over the life of the tree as well as for the current season. Changes in the varietal composition and geographic location of the bearing acreage and in the proportion of trees at or near full maturity also are important.

Comparative Yields

Over the years yield in California has been about 40 per cent lower for plums than for other deciduous tree fruits and for grapes. A substantial increase occurred during the past quarter century. At present, yields are 75 per cent above the 1920–34 average for plums and grapes and 115 per cent higher for other deciduous tree fruits. A brief comparison of relative yields in California since 1920 is summarized on page 14.

A comparison of yields for different plum varieties and producing areas is not available because yield data are not published on this basis. These relative yields are indicated, however, by a comparison of bearing acreage figures for specific varieties and districts and corresponding out-of-state shipments. Such comparisons are not entirely satisfactory, of course, since interstate shipments do not represent the same proportion of each segment of the plum crop. Yet some valid generalizations can be made on the basis of the information summarized in table 5.

Apparently yield is considerably higher in the South San Joaquin area than in the Placer and Sacramento districts. This conclusion agrees with the general observation that the flat, fertile lands of the San Joaquin Valley, in addition to producing larger size of individual fruit, give a higher yield than the hilly areas of Placer District. It has been estimated that the usual commercial yield for good mature orchards averages some 8 tons in South San Joaquin District, 5 tons in the Placer District and in San Joaquin County, and 2 to 3 tons in Solano County.

Differences of about the same magnitude seem to exist among yields of important varieties. Some varieties are more productive and more regular bearers than others. Apparently yield is higher for Beauty, Santa Rosa, Duarte, and Tragedy, and lower for Climax, Burbank and some of the minor varieties. These comparisons are based on volumes shipped east per bearing acre rather than on yields produced, and make no allowances for varietal differences in local fresh sales, quantities processed, and amounts remaining unsold.

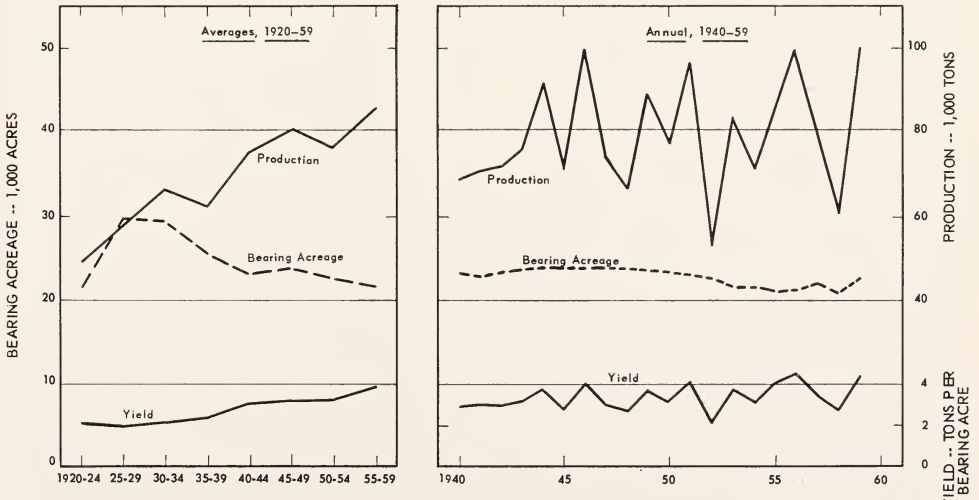


FIGURE 5. PLUM PRODUCTION, BEARING ACREAGE, AND YIELD.

The figures for "other districts" and "other varieties" must be interpreted with caution. Presumably local sales are more important, relatively, for plums grown in the scattered "other districts." The "other varieties" includes proportionally fewer trees at or near full maturity since much of this acreage consists of discontinued varieties with few plantings during the past twenty-five to thirty years and of new introductions set out mainly during the past decade.

Yield Trend

The general level of yield remained at about 2.2 tons per bearing acre until

Table 4. California Yields for Plums and Other Fruits

Years	Plums	Other deciduous tree fruits	Grapes
	Tons per bearing acre		
1920–34	2.2	3.3	3.8
1935–39	2.4	4.2	4.5
1940–44	3.2	4.5	4.8
1945–49	3.4	5.9	5.6
1950–54	3.4	6.3	5.7
1955–59	3.9	7.2	6.7

Table 5. Interstate Shipments of California Plums In Relation to Bearing Acreage

District and variety	Three-year averages		
	1939–41	1949–51	1954–56
	Crates per bearing acre		
State total	165	193	215
South San Joaquin	227	231	275
Placer	178	194	183
Sacramento	126	153	175
Other districts	43	55	53
Beauty	169	204	288
Santa Rosa	199	233	235
Duarte	301	289	195
President	143	195	206
Climax	98	108	94
Burbank	146	149	160
Tragedy	147	275	271
Wickson	165	180	205
Kelsey	139	148	195
Other varieties	122	94	60

1935. It increased steadily thereafter to an average of almost 4 tons maintained during recent years.

According to figure 5 annual fluctuations are substantial, averaging 0.77 tons (or 22 per cent of the average yield) during the past two decades. The change in yield from one season to the next was over 1.0 ton in six of the past twenty years, 0.5 to 0.9 tons in nine years, and below 0.5 tons in five. Fluctuations of such magnitude result in corresponding variations in production and hence in quantities available for fresh sales. They have a direct and important effect upon farm prices.

Future Yields

The upward trend in average yield during the past quarter century is due to several factors. The shift in location and varietal composition of California's plum acreage since 1935 has generally been to more productive areas such as the South San Joaquin District, and to more productive varieties, such as Santa Rosa and Duarte. This shift will probably continue.

Better cultural practices introduced over the years also served to raise yields. They will continue to be used, and even improved further, unless prices drop so low that such expenditures become prohibitive. But even if this happens, the better care trees have already received will have a beneficial effect, though decreasingly so, on yields for the immediate future.

In view of these considerations an average yield of 4.0 tons per bearing acre appears likely for the early 1960's. It could go higher but a sharp increase above the present level is not expected.

HERE IS THE PRODUCTION AND UTILIZATION PICTURE

Production is determined by acreage and yield. Major factors influencing these two determinants have been discussed. Table 6 indicates the production of the plum crop and its utilization since 1910.

Until 1930 only negligible quantities of plums were not utilized. Since 1931 quantities not harvested and used (because of excessive production or depressed economic conditions) exceeded 7 per cent of the crop during nine seasons: 1931–33, 1939–42, 1949 and 1953. Smaller quantities were left unharvested in nine other years. Utilization was complete during only 11 of the past 29 seasons.

Competition from Other States

California's position is somewhat influenced by the real and potential competition from plums grown in other states and from prunes.

Plums grown commercially in Michigan (some 6,000 tons) are utilized chiefly for jam and jelly-making. Most of the small production from Texas, Utah and other areas is sold at local markets. Texas, however, does make carlot shipments during May and early June when early plums start moving from the South San Joaquin District.

Fresh prunes from the Pacific Northwest are sold in large volume—40,000 tons compared to 75,000 tons of California plums. These marketings become substantial only after most California plums are shipped. The last 20 to 25 per cent of California's plum shipments, however, are made after July when the supply of Northwest fresh prunes is large. This particularly affects the producers in the Placer District because almost half of their plums move to market at this time.

California prunes offer no competition since this crop is almost entirely dried. They are used fresh only occasionally and in small quantities.

Table 6. Production and Utilization of California Plums, 1910–59

Five-year average	Production total*	Quantities utilized for:						
		All sales	Fresh marketings			Canning	Freezing	Crushing
			Total	Out-of-state	Intra-state			
	Tons, fresh weight							
1910–14	24,400	24,200	21,880	19,800	2,080	2,320	0	
1915–19	36,600	36,400	33,460	29,840	3,620	2,940	0	
1920–24	48,800	48,600	46,120	41,760	4,360	2,480	0	
1925–29	58,600	58,400	55,600	48,960	6,640	2,800	0	
1930–34	66,800	61,720	59,840	51,340	8,500	1,880	0	
1935–39	62,400	60,700	58,940	47,660	11,280	1,760	0	
1940–44	76,000	72,100	68,380	54,260	14,120	1,500	380	1,840
1945–49	80,400	77,900	73,800	58,860	14,940	1,960	580	1,560
1950–54	76,400	72,900	70,780	56,420	14,360	1,660	460	0
1955–59	84,200	81,500	77,880	64,100	13,780	1,520	2,100	0

* Difference between total production and all sales consists of small amounts used directly by the farm household (200 tons per year until 1930 and 300 tons thereafter) and quantities not utilized for the period since 1931.

Production Trend

Since 1910–14 the average annual crop increased almost fourfold from 24,000 to 85,000 tons. This expansion was considerably more rapid during the earlier years. Production increased at an annual rate of 3,000 tons until the early 1930's and 750 tons thereafter.

This upward trend in production primarily resulted from an increase in bearing acreage until about 1930 and from a sharp rise in yield since 1935. Annual fluctuations in yield, chiefly caused by varying weather conditions, brought about large short-run changes in production. During the past twenty years such annual changes amounted to 18,000 tons, or 23 per cent of the average crop.

Future Production

Production trends for the years ahead must be estimated on the basis of future bearing acreage and yield, both expected to increase during the next few years. An average crop of some 90,000 to 100,000 tons seems probable under normal weather and growing conditions. This increase, although equal to or greater than that existing since the 1940's, will not be as rapid as it was during earlier decades.

This projection of future production assumes that

- ¶ good cultural practices will be continued in the principal producing areas, even if prices decline;
- ¶ tree removal will be at a rate below the high level of the 1930's and will be confined chiefly to varieties with low net return per acre;
- ¶ more of the bearing acreage will be located in South San Joaquin (where yields are higher), will be of the more productive varieties, and will be at or near full production.

Processing

Normally processing is limited largely to certain green and yellow varieties (especially Jefferson, Yellow Egg, and Washington) which are not produced for fresh shipment to eastern markets. This

outlet is a minor one for plums. Generally 2,500 to 3,000 tons have been processed each year, with a low of 1,500 tons during 1931–42 and a peak of 7,200 tons in 1943–46. As production quadrupled since 1910–14 the proportion processed declined from 10 to 3 per cent.

Canning was the only processing outlet until World War II. An average of some 2,600 tons was canned annually in 1910–29, and 1,700 tons during the past quarter century. Expressed in percentage of the total crop, canning dropped from 9 to 2 per cent.

An additional 5,200 tons were crushed and frozen annually for remanufacture into jams and pellies during the war period (1943–46), when government requirements for bread-spreads were large and berry production was small. Crushing was discontinued after 1946, but freezing continued. Since 1954 the quantity frozen increased substantially, primarily for packing into large containers used by the institutional trade. An average of 1,700 tons was frozen (compared to 1,600 tons canned) during 1954–58.

Processing may expand further. But even if it doubled, this outlet would be only a small portion of the plum crop.

Fresh Sales

Plums are used chiefly for fresh consumption. This outlet represented 91 per cent of the harvested crop during 1910–19, increased to 96 per cent, and has remained at that level since 1930. Thus fluctuations in fresh marketings parallel closely variations in harvested production.

If production increases as indicated above, fresh consumption must expand materially since processing is not likely to absorb many of the additional plums. The only alternative is for large quantities to be left unharvested in most years. This situation has already developed. During the past two decades, the entire crop was fully utilized in only one-third of the years.

The surplus problem will become particularly serious in years when favorable weather conditions produce bumper crops—say, of 110,000 tons or more. However, if consumer purchasing power continues to increase at or above the present rate, the price-depressing effect of excessive production in years of heavy yield will be offset, at least in part.

BULK OF THE CROP IS SHIPPED TO INTERSTATE MARKETS

In the past out-of-state markets have been the major outlet for the California plum crop. This situation is likely to continue. This section describes certain aspects of preparing plums for their long journey to markets, the source and destination of these shipments, and their varietal and size composition.

Preparation and Handling

Plums, being perishable, undergo changes after harvest: as the fruit ripens its flesh softens and ultimately becomes overripe. Mature plums have a better flavor but require more careful handling to avoid bruising and are not profitable. Hence, wholesalers and retailers prefer firmer, "greener" plums which hold up better during numerous rehandlings.

It is necessary to determine when the fruit should be picked to combine suitable carrying and handling character with good dessert quality. Then plums must be packed properly, handled carefully, and precooled promptly. Ranch packing has been largely replaced by central packing houses, which are equipped to handle and cool the fruit

rapidly. These shipping agencies collect the plums from various producers, pack them, assemble the cars, and make shipments and sales.

The use of trucks for shipping plums to out-of-state markets has increased considerably during recent years. The proportion moved by trucks increased from 8 to 18 per cent between 1950–54 and 1955–58. Most of the truck shipments are destined for markets located in western states. Shipments to the more distant markets are still made almost entirely by railroad. Although some straight cars (containing a single variety) are loaded, the bulk of these shipments consists of several varieties. Often, plums are shipped in mixed cars with other fruits. The wholesale trade, however, prefers not to receive many small lots of 10 to 20 crates each. As a consequence, there has been a tendency to ship only a few varieties in each car. This is an additional reason why the number of varieties produced for shipment to out-of-state markets has been reduced.

During recent years much criticism has been directed toward the large distributive margins and possible inefficiencies in the marketing process. Actually, however, very little information is available to show just what this margin is, what the costs of distribution are, how thoroughly consumers are supplied, and what economies might be effected. Although many improvements have been introduced, there undoubtedly is a further need for securing faster movement, better equipment, and lower costs.

The Plum Crate

The standard four-basket crate has proved to be the most satisfactory container for shipping plums to distant markets. About 95 per cent of the plums

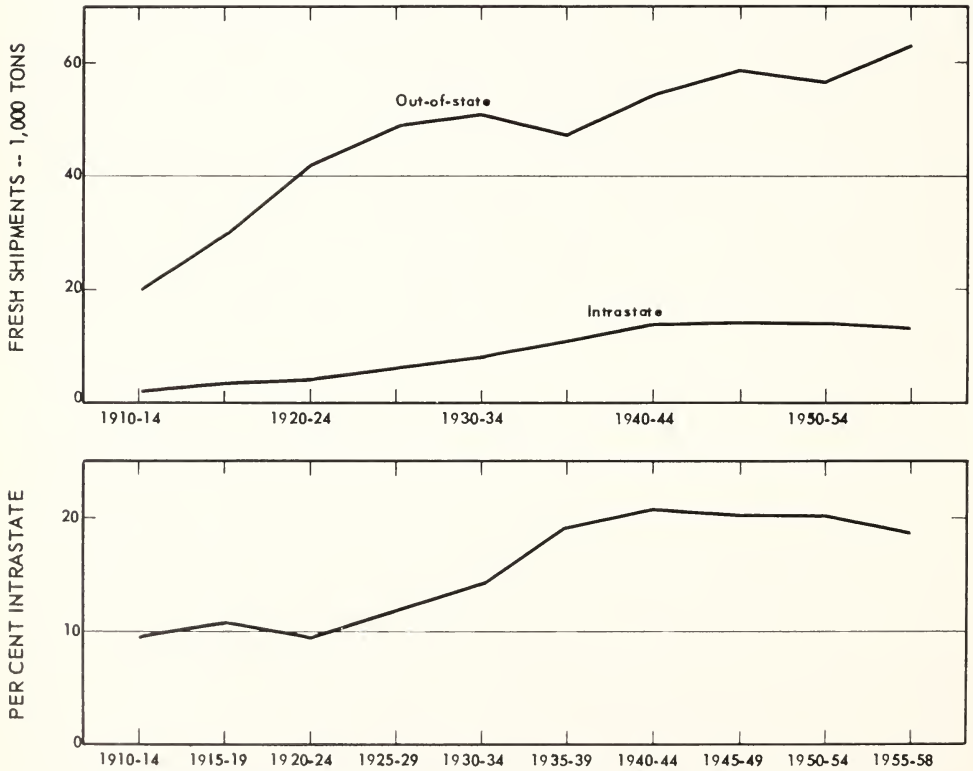


FIGURE 6. OUT-OF-STATE AND INTRASTATE FRESH SHIPMENTS, 1910–58.

shipped from California are packed in this container.

The crate has four baskets, each containing three layers of plums of approximately uniform size separated by paper skims. The number of plums packed in a basket depends upon their size. Because the baskets taper toward the bottom, the lower layer usually is packed with one row fewer than the middle and top layers.

Pack size is designated by the number of plums contained in the upper layer of each basket. Thus a 4×5 size marking means that the top and middle layers each contain 20 plums (five rows of four plums each) while the bottom layer contains 16 plums. This gives a count of 56 plums per basket or 224 per crate. Similarly, 5×5 means 70 plums in each basket (25, 25, and 20 in the three layers), or 280 per crate. Some plums are packed in crates designated $3 \times 4 \times 5$ and $4 \times 5 \times 5$.

In other words, the larger size designations indicate smaller individual fruits. For example, 5×5 plums are smaller than those marked 4×5. The plum count for six packs in general use is as follows:

Marking	Assignment in layers			Count per	
	Top	Middle	Bottom	Basket	Crate
4x4	4x4	4x4	3x4	44	176
3x4x5	4x5	3x5	4x4	51	204
4x5	4x5	4x5	4x4	56	224
4x5x5	5x5	4x5	4x5	65	260
5x5	5x5	5x5	4x5	70	280
5x6	5x6	5x6	5x5	85	340

Total Shipments

Fresh sales increased substantially until the early 1930's and more slowly thereafter. Figure 6 shows that local sales increased much more rapidly than out-of-state sales between about 1920 and 1940. As a result, the relative importance of in-state sales rose from 10 per cent of the total in 1910–24 to about 20 per cent for the period since 1935.

Interstate shipments increased from 20,000 tons per year in 1910–14 to 50,000 tons in 1930–39 and 65,000 tons for 1955–59. This expansion averaged 1,600 tons per year until the early 1930's and 500 tons per year thereafter.

On the average, Californians eat three

Table 7. Initial Destination of Interstate Carlot Shipments of California Plums

Region	1930–34	1935–39	1940–44	1945–49	1950–54	1955–57
North East	1,806	1,543	1,730	1,370	1,062	1,218
North Central	1,817	1,298	1,685	2,218	2,179	2,003
South	163	135	261	259	165	165
West (except California)	145	94	109	112	38	17
Total domestic	3,931	3,070	3,785	3,959	3,444	3,403
Exports	280	451	195	256	191	205
Total	4,211	3,521	3,980	4,215	3,635	3,608

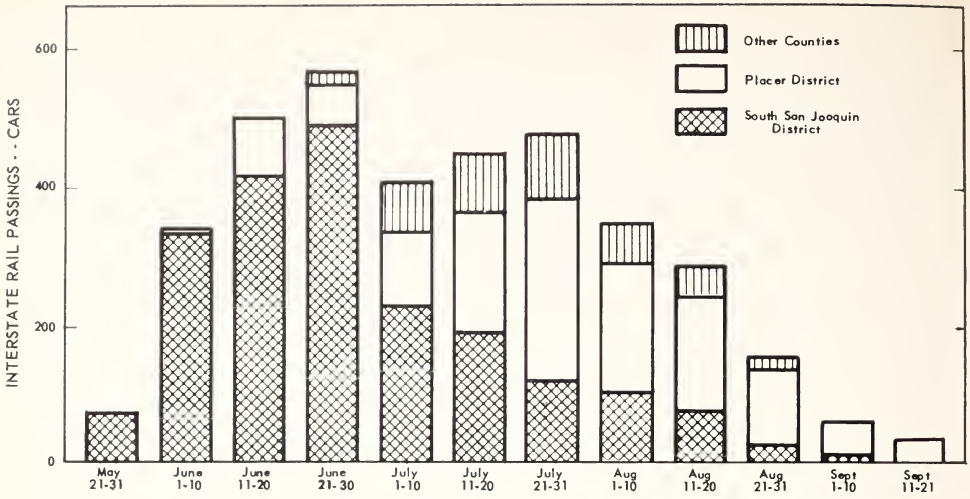


FIGURE 7. INTERSTATE RAIL PASSINGS, BY DISTRICT, BY TEN-DAY PERIODS 1953–57 AVERAGE.

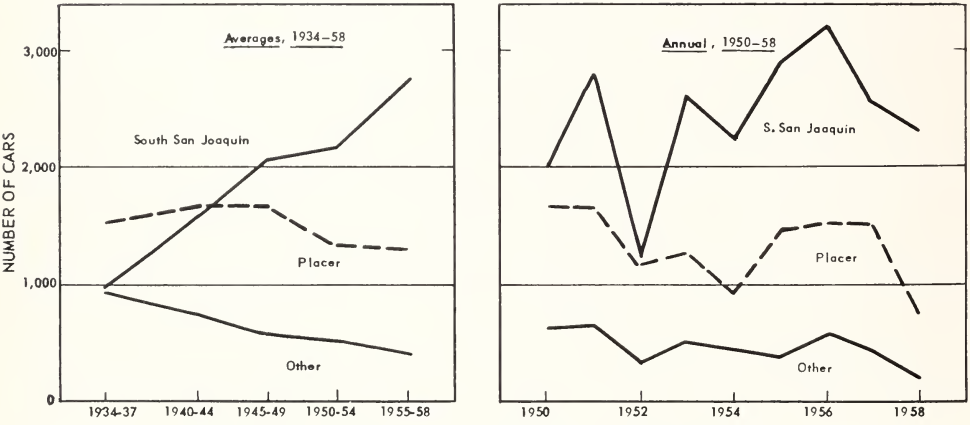


FIGURE 8. OUT-OF-STATE SHIPMENTS, BY DISTRICTS.

to four plums for every one eaten by persons residing elsewhere in the nation. The geographical pattern of plum consumption in the other states can be approximated by the data summarized in table 7 which shows the destination of interstate shipments as compiled from shipper's manifests. These data exclude less-than carload lots and truck shipments and are not corrected for diversions beyond the initial destinations. Hence, the information somewhat overstates shipments to the North Central Region and understates movement to other areas.

These statistics, however, do indicate the general movement. Apparently the bulk—some 85 per cent—of the interstate shipments moves to markets in the northern states, primarily the industrial belt extending from Chicago to New York City. The balance is split almost equally between shipments to southern and western states (exclusive of California) and exports, principally to Canadian markets. The decline in carlot shipments to western markets since 1950 is explained by the increase in truck movement to this area during the past decade.

Shipments by Districts

Plums grown in the principal areas of the state mature at different dates. Trends in acreage and production vary considerably among the areas. For these reasons shipments from the various districts differ substantially with respect to both seasonal movement and trend in the volume shipped.

The earlier shipping dates for South San Joaquin are revealed by figure 7. About one quarter of the plums from this district are shipped before mid-June, another half during the next four weeks, and the remainder after July 10. In other words, shipments begin in late May, increase rapidly to a peak movement during late June, and decline substantially during each subsequent week.

Shipments from Placer District follow a similar pattern but are made later. This apparent delay in movement is due mainly to the fact that a much greater proportion of the plums from Placer District are later-maturing varieties. Actually, initial shipping dates for specific varieties follow those for South San Joaquin by only a few days. But even this difference is important because the price has already dropped by the time Placer plums of a given variety reach the market.

Figure 8 shows considerable differences in the trend in interstate shipments for the major districts. During the past twenty years shipments originating in South San Joaquin increased three-fold from 960 to 2,750 cars. They declined

Table 8. Interstate Carlot Shipments of California Plums, by Variety, 1935–59

Variety	1935–39	1940–44	1945–49	1950–54	1955–59	South San Joaquin	
						1939–41	1954–56
	Car of 1,000 packages					Per cent of state	
Beauty	434	513	575	471	630	58	82
Santa Rosa	646	1,104	1,467	1,596	1,851	73	83
Duarte	263	502	633	644	660	3	26
President	232	364	337	324	330	8	36
Four varieties	1,575	2,483	3,012	3,035	3,471	44	69
Burbank	169	154	124	82	63	1	0
Tragedy	188	182	159	168	159	22	32
Wickson	271	238	194	126	104	45	57
Kelsey	162	190	169	113	116	26	45
Four varieties	790	764	646	489	442	27	38
Eight varieties (Climax, Diamond, Formosa, Gaviota, Giant, Grand Duke, Gros Hungarian, Sugar)	686	506	377	197	116	15	14
Other varieties	158	212	235	293	528	25	50
All varieties	3,209	3,965	4,270	4,014	4,557	35	61

from a level of 1,600 cars during 1934–49 to 1,300 cars since 1950 for Placer District. Shipments from "other areas" decreased steadily from 940 cars in 1934–37 to 400 cars in 1955–58. The Vacaville and Sacramento River areas shipped 550 cars twenty years ago and now account for less than 10 cars annually. Shipments from South San Joaquin rose from 28 to 62 per cent of the total while those from Placer District and "other areas" declined from 45 to 29 and from 27 to 9 per cent, respectively.

Varietal Composition

Quantities of different varieties of plums shipped from the state follow closely their production. Only a few of the less important varieties are used principally for processing or for intrastate fresh sales. Information on shipments by varieties is compiled by the California Tree Fruit Agreement from shipper's manifests furnished in compliance with requirements of the industry's marketing control program. These data are summarized in table 8 for the period since 1935, except for 1938 when information was not collected.

During the past twenty years the shipment of the four major varieties (Beauty, Santa Rosa, Duarte, and President) increased sharply from 1,575 to 3,430 cars per year. Twelve varieties which were important two decades ago declined from 1,480 to 570 cars. Shipments of "other varieties" increased considerably, especially during recent years. This category includes several new promising introductions.

Because of these differing trends, the four major varieties increased from 49 to 77 per cent of total shipments. The twelve other varieties listed by name in table 8 decreased from 46 to 13 per cent and "other varieties" expanded from 5 to 10 per cent since 1935–39.



FIGURE 9. MINIMUM GRADE AND SIZE PERMITTED UNDER FEDERAL MARKETING AGREEMENT 1946–59.

NOTE: Annual levels in figure 9 are simple averages of minima specified for different varieties. Since changes in regulations during this period were similar for the individual varieties, this procedure is not misleading.

Computing annual size minima presents a problem since different pack sizes are used for specifying varietal minima depending on fruit size. This difficulty is resolving by expressing varietal minima relative to 6x6 pack for Tragedy and Late Tragedy; 5x6 for Sugar; 5x5 for 10 varieties; and 4x5 for 10 varieties. The composite pack is termed the "reference size" for the annual size minima. This reference size, used here for convenience, does not correspond to any size actually packed but remains constant over the period under study.

Regulations issued since 1936 for individual varieties, under the federal and state programs, are too numerous to permit separate discussion here. These details are given in the report mentioned on page 34.

Size Distribution

Plums fluctuate in size from variety to variety and from year to year. The size distribution of shipments is modified further by grade and size regulations issued under the industry's marketing control program. These regulations reduced the volume of smaller sizes permitted to be shipped. Figure 9, page 22, shows the trend.

The extent to which the size composition of shipments was modified is indicated by comparing 1945–49 with 1955–58. Shipments of 4×4 and larger packs doubled. This increase was from 15 to 32 per cent for early plums, 28 to 50 per cent for midseason varieties, and 33 to 63 per cent for late plums. Packs smaller than 4×5 declined from 29 to 10 per cent of total shipments.

This indicated shift is due to shipping relatively more of the larger-fruit varieties. It is inherent in the marketing controls employed and occurred for each variety. A detailed comparison is shown in table 9 for the eight major varieties, representing 83 per cent of total shipments. For each, there is a considerable increase in relative shipments of large sizes and a substantial decrease for small sizes. Since these varieties differ in fruit size, their shipments may be divided into two segments of about equal volume representing packs of larger and smaller sizes. If this is done, each pack in the former group increased in relative shipments while each of the smaller sizes decreased. Similar changes occurred for varieties not listed in table 9.

Obviously, larger plums are shipped now than even 10 or 15 years ago. Marketing restrictions have eliminated shipments of small sizes and also have an indirect effect on size: as smaller sizes are restricted from interstate shipment, growers tend to alter their cultural practices so they will get a larger proportion of their crop over the minimum size. For several varieties, there was a decrease in shipments of the smallest permitted size and a correspondingly very large increase for the largest sizes. For example, 4×5 packs are the minimum sizes set for Santa Rosa, Duarte, and President during 1955–58. But relative shipments of this pack declined while shipments of larger sizes doubled.

HAVE INDUSTRY CONTROLS IMPROVED MARKETING?

The development of the plum industry, its economic problems, and attempts at their solution—first voluntary marketing plans, then compulsory programs—are similar to those of other California deciduous fruit industries. Compulsory controls were initiated in 1933 for interstate plum shipments and in 1950 for intrastate fresh sales. Continued support of these marketing controls presumably signifies the industry's confidence that grower and handler returns are increased without prejudicing long-run interests.

Early Programs

One of the earliest federal marketing agreement programs, No. 6 issued under the marketing adjustment provisions of the Agricultural Adjustment Act of 1933, covered the interstate and foreign shipments of fresh California deciduous tree fruits other than apples. The first phase of this program was one of experimentation in which the control mechanism and the administrative set-up were considerably modified. It encompassed three separate agreements extending from October 1933 to March 1938.

The first agreement, authorizing period prorations, was developed too late to permit its use in 1933. This plan proved grossly unsatisfactory the following year and operations were discontinued after only a few days. The second agreement changed the administrative provisions and permitted grade and size restrictions. Since it became effective late

Table 9. Size Composition of Interstate Shipments of California Plums, 1945–49 and 1955–58*

Size designation†	1945–49	1955–58	Change	1945–49	1955–58	Change	1945–49	1955–58	Change	1945–49	1955–58	Change
	All varieties			Early varieties			Mid-season varieties			Late varieties		
4 × 4	22.4	43.2	20.8	15.1	32.1	17.0	28.0	50.5	22.5	32.8	62.6	29.8
3 × 4 × 5	7.7	10.5	2.8	3.9	8.2	4.3	10.7	13.7	3.0	13.1	12.2	− 0.9
4 × 5	40.8	36.4	− 4.4	49.7	47.9	− 1.8	33.3	24.9	− 8.4	34.2	20.9	−13.3
4 × 5 × 5	0.6	0.3	− 0.3	0.5	0.3	− 0.2	0.7	0.3	− 0.4	0.7	0.3	− 0.4
5 × 5	25.4	8.5	−16.9	30.7	11.5	−19.2	19.0	6.8	−12.2	16.7	3.2	−13.5
5 × 6	2.7	1.0	− 1.7	0.1	0	− 0.1	7.3	3.6	− 3.7	2.2	0.7	− 1.5
6 × 6	0.4	0.1	− 0.3	0	0	0	1.0	0.2	− 0.8	0.3	0.1	− 0.2
	Beauty			Santa Rosa			Duarte			President		
4 × 4	2.2	7.2	5.0	18.8	41.9	23.1	15.3	39.5	24.2	27.1	61.6	34.5
3 × 4 × 5	2.1	6.3	4.2	4.2	8.9	4.7	13.6	20.2	6.6	16.0	13.9	− 2.1
4 × 5	35.8	51.6	15.8	55.2	46.7	− 8.5	46.0	35.9	−10.1	41.9	24.1	−17.8
4 × 5 × 5	1.1	0.9	− 0.2	0.2	0	− 0.2	0.7	0.2	− 0.5	0.7	0	− 0.7
5 × 5	58.5	34.0	−24.5	21.6	2.5	−19.1	24.4	4.2	−20.2	14.0	0.4	−13.6
5 × 6	0.3	0	− 0.3	0	0	0	0	0	0	0.3	0	− 0.3
	Eldorado			Late Santa Rosa			Late Duarte			Kelsey		
4 × 4	48.2	75.4	27.2	37.6	69.0	31.4	21.2	48.1	26.9	78.1	99.8	21.7
3 × 4 × 5	9.7	6.7	− 3.0	12.1	7.1	− 5.0	20.5	23.7	3.2	6.0	0.1	− 5.9
4 × 5	35.2	17.9	−17.3	38.9	23.5	−15.4	41.2	26.1	−15.1	15.0	0.1	−14.9
4 × 5 × 5	0.1	0	− 0.1	0.4	0.1	− 0.3	0.8	0.1	− 0.7	0.2	0	− 0.2
5 × 5	6.7	0	− 6.7	11.0	0.3	−10.7	16.3	2.0	−14.3	0.7	0	− 0.7
5 × 6	0.1	0	− 0.1	0	0	0	0	0	0	0	0	0

* The figures are percentages of variety shipments (crate pack only) represented by various size packs. All amounts of less than 0.05 per cent are designated by "0". The 1945–49 average refers to 1946–49 for Duarte, Late Duarte, Santa Rosa, and Late Santa Rosa.

† Size 4 × 4 includes larger packs and 6 × 6 includes smaller packs. There were no shipments smaller than 5 × 6 for the eight varieties shown separately.

in the season and the crop was small, plum regulations were not attempted in 1935.

The third agreement, extending the economic provisions of the superseded agreement, was adopted in May 1936. It was used to restrict plum shipments during two seasons. Size regulations were used in 1936. The following year grade and maturity as well as size restrictions were imposed. Because of real and fancied annoyances and difficulties growers became hostile to the program and voted overwhelmingly against its extension beyond 1937.

Present Program

After a season of disastrously low prices in 1938 ($25.50 per ton compared to $37.75 for 1934–37 in the case of plums), growers eagerly adopted a fourth agreement. It was limited to fresh interstate shipments of California plums, Bartlett pears and Elberta peaches. The administrative organization and control mechanism, evolved under previous agreements, were incorporated into the new agreement. Although several minor revisions were made, the basic framework has continued in force since May 29, 1939.

A control committee of 12 shipper and 13 grower members supervises the program and handles disputes. Actual operations of the regulatory provisions are supervised by three separate commodity committees composed of grower members—seven in the case of plums. A sales managers' committee of seven members acts in an advisory capacity to these commodity committees.

Of the three regulatory devices in the agreement only one is used for plums: grade and size restrictions on fresh interstate shipments. Such regulations may be applied on both a varietal and a district basis, but in practice have been imposed only on a varietal basis. Apparently, the economic benefits, if any, to be gained from specifying different limitations for the several districts are deemed insufficient to overcome the difficulties involved in assuring various segments of the industry that equitable treatment is received.

The grade and size control technique includes certain minor provisions. Federal-state inspection may be required as proof of compliance. Maturity requirements are issued in conjunction with grade regulations. These state the color which each variety shall attain "at time of picking" so as to insure a proper completion of the ripening process. Exemption certificates are issued to allow each grower to ship prohibited grades and sizes in such volume as necessary "to permit him to ship as large a proportion of his crop of such variety as the average for all growers in his district."

No concerted action at expanding—not just modifying—the program was undertaken until the late 1940's. In 1949 "plums" were separated into "early plums" and "other plums" on the basis of season of marketing. This change was made primarily so the parity price curb would not be used to deny the benefits of marketing control to producers of late plums because of high prices received for early varieties.

At about this same time plum growers and dealers met with representatives of the California Bureau of Markets to develop a state marketing agreement. Their objective was to secure a program for regulating intrastate shipments of plums for fresh consumption which would complement the control established under the federal marketing agreement. The state agreement, issued under provisions of the California Marketing Act of 1937, became effective on April 25, 1950. It has been operated each season since then.

Program Operation

Restrictions upon the shipment of small sizes and inferior grades were im-

posed under the present agreement each season since 1939, with two exceptions. Regulations could not be issued in 1943 and in 1944 because grower prices were expected to exceed parity levels. Minimum grade requirements were continued, however, under War Food Order No. 55 issued by the United States Department of Agriculture. In 1945, 1946, and 1948, regulations were terminated after approximately two-thirds of each crop was shipped because farm prices rose above parity.

Since its adoption in 1950, the state program has been used primarily to extend controls to plums shipped for fresh consumption within the state. Its regulations, though couched in different terms, are parallel to those issued under the federal agreement.

Accomplishments

Grade and size restrictions applicable to interstate shipments since 1946 are shown in figure 9. As can be seen, increasingly lesser proportions of lower grades and smaller sizes were permitted to be shipped under federal marketing controls. Since 1946–48, grade tolerance has been reduced from 12 per cent to 3 per cent below U. S. No. 1 grade. Minimum size has been raised by about half a size. For example, the minimum was raised for Beauty from 100 to 50 per cent 5×5 pack, for Santa Rosa from 50 to 0 per cent 5×5, and for Tragedy from 50 to 0 per cent 6×6.

Because physical characteristics differ among varieties, restrictions also differ. Minima are set at different levels and show sharper increases for some varieties than for others. The changes, however, are approximately comparable.

One result of the program already has been mentioned: the pronounced shift, since 1945, toward shipping larger sizes in interstate shipments. Similar information cannot be presented on grade because such data are not collected. Well-informed observers conclude that the average quality of shipments has improved over the years and that this result is due, at least partly, to operations of the marketing control program.

This evidence, of course, does not indicate an increase in grower prices. Generally, larger sizes and better quality do raise returns to producers. The over-all impact of these controls, therefore, would appear to be beneficial to the industry.

Admittedly, there is much that is not known about the economic implications of marketing controls. There is relatively little in the way of quantitative studies to show their effect on price and other factors. Operation of the program, however, is not expensive. Even meager benefits might justify its continuance. Among the additional accomplishments of the program are the following: administrative procedures have been shaken down into stable patterns; problems encountered in earlier years were resolved to the mutual satisfaction of different industry groups; the program served as a vehicle for getting growers and handlers together for a better understanding of industry problems, the alleviations of mutual suspicions, and the dissemination of information; it served as the focal point for many endeavors relating to production and marketing.

AUCTION MARKETINGS GIVE CLUES TO PRICE TRENDS

Since most plums are consumed fresh, especially at out-of-state markets, terminal market prices will be discussed in detail. Attention is focused upon sales of plums packed in the standard four-basket crate because a large proportion of plums are shipped in this container.

Differences by Markets

The distribution of sales among individual auction markets has not changed greatly. For the period since 1935 about 47 per cent of auction sales were made

at New York, 15 at Chicago, 12 at Philadelphia, and 26 at the nine other auctions. This distribution pattern prevailed throughout the 25 years with one important exception: Sales at the minor markets declined from 29 to 22 per cent of the total while relative sales increased at each of the three major auction markets.

Generally the New York auction price is slightly above the average received at other auctions. This differential amounts to about 7 cents per crate. When prices at the various auction markets are compared meticulously by varieties and weeks the differential is still less and can be explained by differences in transportation costs.

Table 10 shows a definite trend toward greater private transactions in selling plums. Since 1935–39 such sales rose from 1.0 to 2.5 million packages, representing an increase from 32 to 54 per cent of total interstate shipments. Auction sales increased until 1946–49 and then declined from 2.6 to 2.1 million packages.

This trend is not likely to be reversed soon. In fact, a further shift, though possibly smaller, appears indicated for the next few years.

A direct comparison between auction prices and private market prices is not possible since data on the latter are not published. Information secured from records of several large shippers of California plums indicates, as would be ex-

Table 10. Auction Prices and Sales Distribution of California Plums, 1935–59

Market	1935–39	1940–44	1946–49*	1950–54	1955–59
	Auction price—dollars per crate				
New York auction	1.49	2.56	3.27	4.31	4.22
Twelve auctions	1.46	2.51	3.23	4.29	4.17
	Sales—1,000 packages†				
Auction markets					
New York	1,020	1,128	1,205	1,026	1,050
Chicago	310	345	381	362	307
Philadelphia	242	293	320	272	277
Three major markets	1,572	1,766	1,906	1,660	1,634
Nine minor markets	652	660	670	578	444
All markets	2,224	2,426	2,576	2,238	2,078
Private sales‡	1,038	1,539	1,867	1,776	2,479
Interstate shipments§	3,262	3,965	4,443	4,014	4,557
	Per cent of interstate shipments				
New York auction	31.2	28.4	27.1	25.6	23.0
Other auctions	36.9	32.8	30.9	30.2	22.6
Private sales	31.9	38.3	42.0	44.2	54.4

* Average excludes 1945 season because of abnormally light sales at auction markets during price control.
† Total of sales in all containers. Boxes and lugs are not converted to equivalent crates.
‡ Difference between auction sales and out-of-state shipments.
§ Data not reported for 1938. The average includes a figure of 3,475 cars (of 1,000 packages) for 1938 estimated on the basis of utilization data.

pected, that New York auction prices are a good indication of the general level of wholesale prices on all sales. Varietal, size, and seasonal differentials in prices for private market sales are similar to those prevailing for auction sales.

In the following discussion we consider New York auction prices and sales, representing almost one-half of auction marketings and one-third of all out-of-state sales. These data are sufficiently representative to indicate changes in the varietal and size composition of sales, in their seasonal distribution, and in relative prices for the various components of total shipments.

Differences by Seasonal Groups

The course of New York auction sales and prices for early, midseason, and late varieties since 1920 are shown in figure 10. Sales and prices, expressed in percentage terms, are shown by five-year averages to eliminate annual fluctuations. Present relative prices and sales are significantly different from those prevailing twenty to forty years ago.

During 1920–44, prices were slightly lower (3 per cent) for midseason varieties than for other plums. The differential remained constant for late plums but not for early varieties. After World War II the price spread was widened consider-

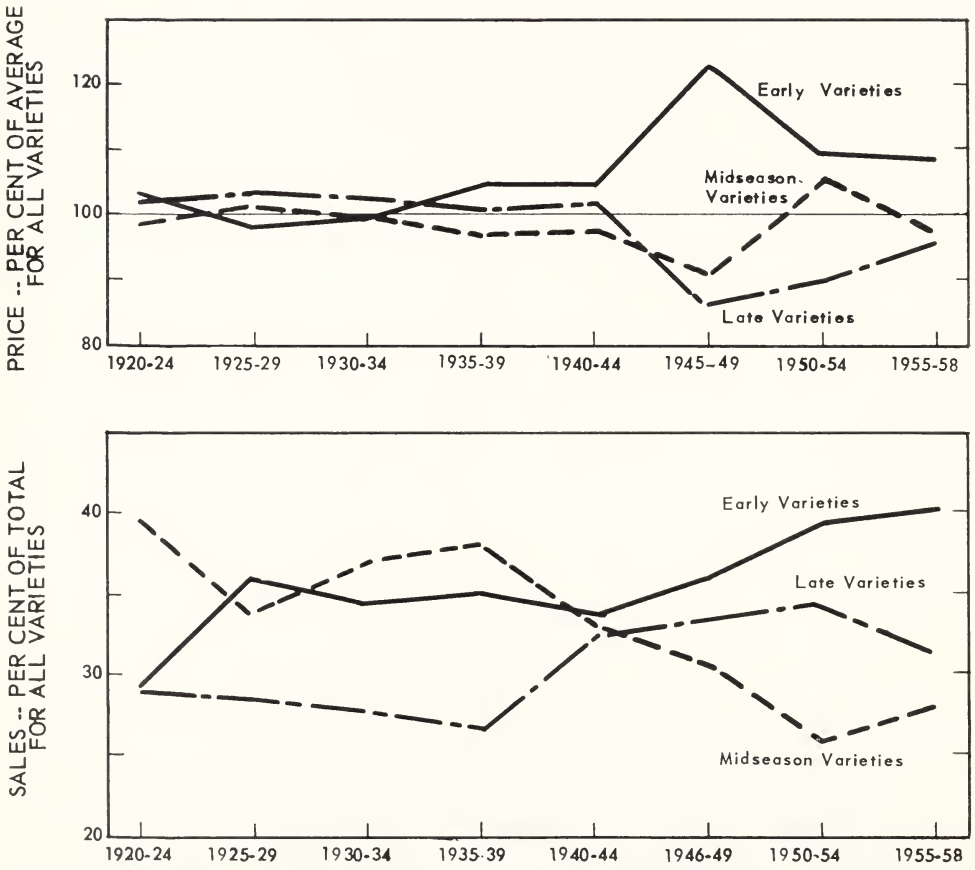


FIGURE 10. NEW YORK AUCTION SALES AND PRICES, BY SEASONAL GROUPS, 1920–58.

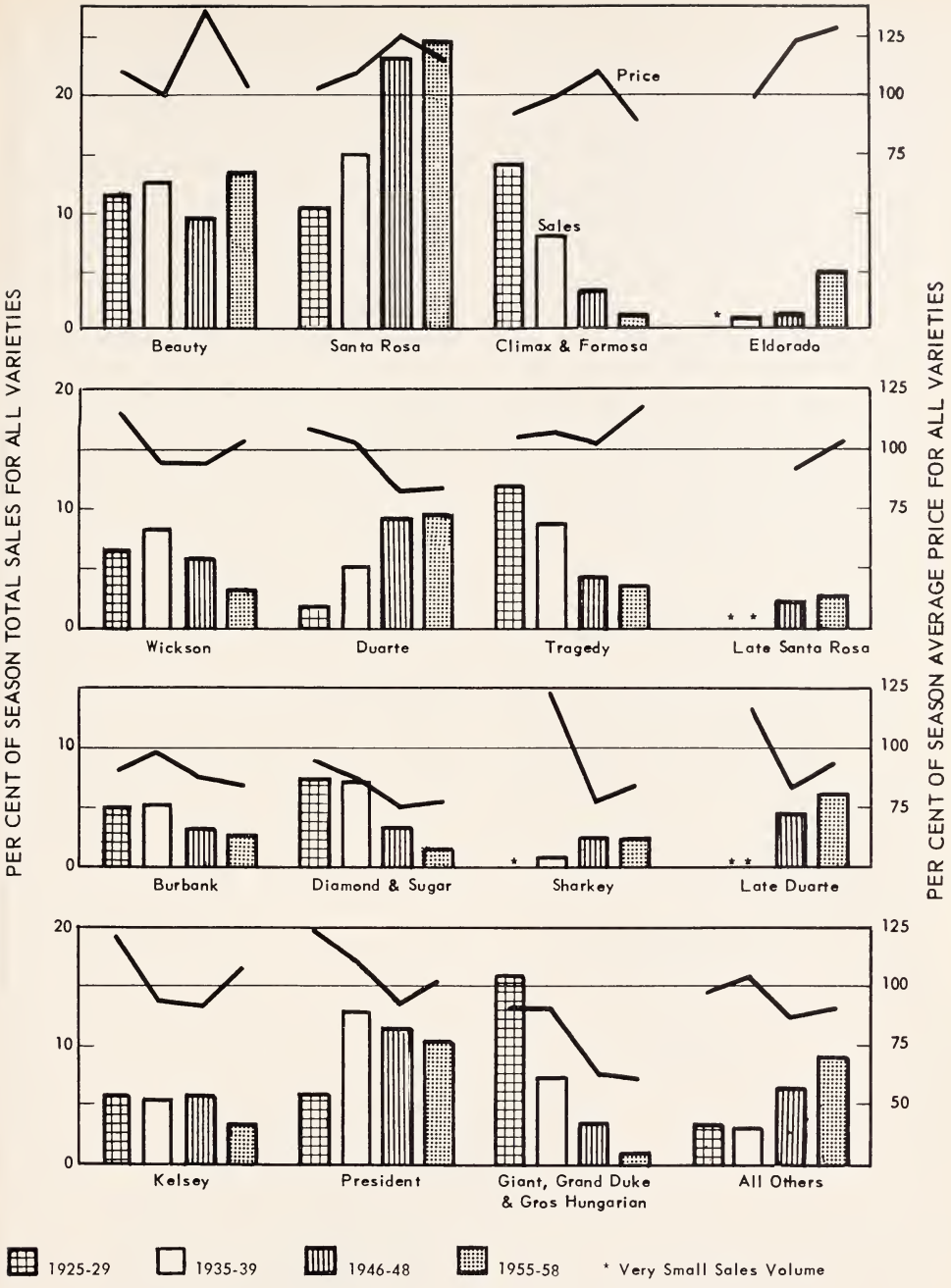


FIGURE 11. NEW YORK AUCTION SALES AND PRICES, BY VARIETIES, AVERAGES 1925–29 to 1955–58.

ably. For the past decade prices were highest for early plums. They averaged 7 and 15 per cent less for midseason and late varieties.

Relative sales also changed. Between 1920–39 and 1950–58, sales of midseason varieties declined substantially—from 38 to 27 per cent. They increased from 34 to 40 per cent for early plums and from 28 to 33 per cent for late plums.

Differences by Varieties

Varietal differences in New York auction sales and prices are shown in figure 11 for alternate five-year averages since 1925. These are expressed as percentages so that changes in relative prices can be compared with variations in relative sales.

Patterns of price changes relative to shifts in sales volume are very dissimilar for the different varieties. For some varieties, relative prices and sales show the same trends (either upward or downward); in other cases they change in opposite directions. These differing patterns are the net results of several factors which may reinforce or offset each other.

Different plum varieties are marketed at successively later marketing periods during the summer months. This progression is shown by figure 12. The four major varieties, representing 60 per cent of total sales are in heavy supply at New York from early June to late September. Their usual marketing periods (for the middle 80 per cent of varietal sales) are: June 7–26 for Beauty, June 22–July 22 for Santa Rosa, July 22–August 14 for Duarte, and August 13–September 16 for President.

The different varieties reach maximum sales in a series of peaks, generally separated one from another by a week or so. Two-thirds of the season sales of most varieties are made within a period of two or three weeks. An even greater concentration of heavy movement is revealed when each producing area is considered separately.

Sales of early varieties, confined largely to June and early July, are practically completed before other plums

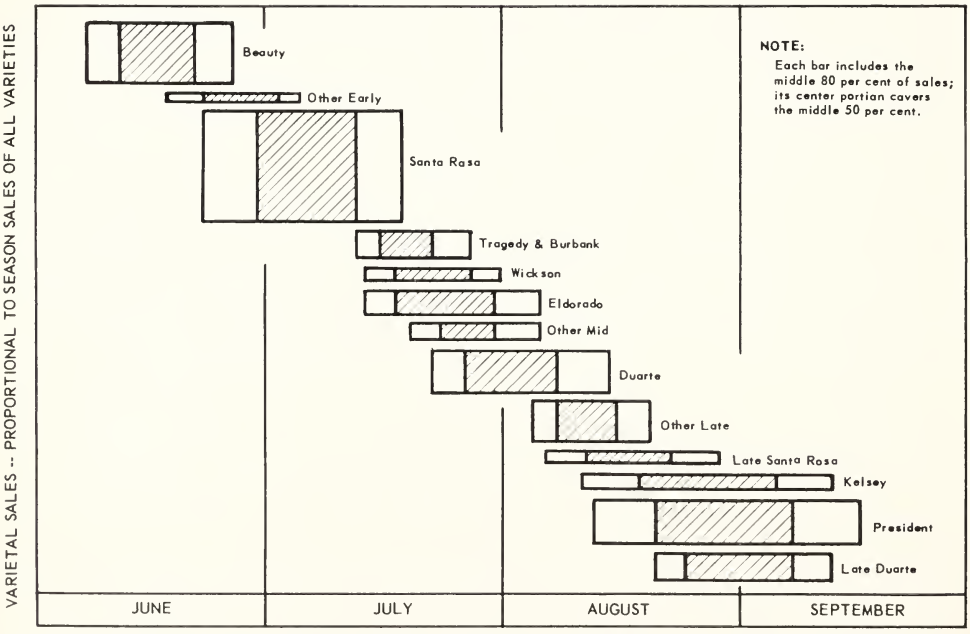


Figure 12. Varietal Marketing Periods at New York, 1955–58 Average.

arrive in substantial quantity. About two-thirds of the volume of midseason varieties are sold between mid-July and mid-August. By the end of this period, late plums are beginning to arrive in large volume. They are in plentiful supply until the close of the plum marketing season in late October. Thus, there is a distinct separation in marketing seasons for these three varietal groups.

Patterns of Weekly Marketings

Substantial changes in the relative production of different growing areas and in the relative volume of different varieties sold have not served to alter very substantially the seasonal distribution of plum sales. There has been a slight tendency for sales to be made somewhat more uniformly during the season and for the season to be extended by a week or two. Most of these changes occurred during earlier years. The pattern of weekly marketings has remained essentially constant for the past twenty or thirty years. Thus, the distribution shown in figure 13 for 1955–58 is substantially that for the 1940's and 1930's.

After the eighth week of the season, sales of early varieties are negligible. About 90 per cent of midseason varieties are marketed during weeks 7–11. Sales of late plums are not substantial until week 10. Thus, during two periods of only two weeks' duration, sales consist of substantial quantities from different varietal groups. Sales are almost equally divided between early and midseason plums during weeks 7–8 and between midseason and late varieties during weeks 10–11.

Factors Affecting Prices

A study made ten years ago indicates the principal factors responsible for variations in auction prices (see Foytik, Jerry, "Characteristics of Demand for California Plums," *Hilgardia*, University of California, April 1951, pp. 407–527). Although this statistical analysis relates to the period 1922–48, its results probably still are applicable. The major findings were:

¶ Auction prices increase substantially (other factors remaining constant) when consumer purchasing power rises.

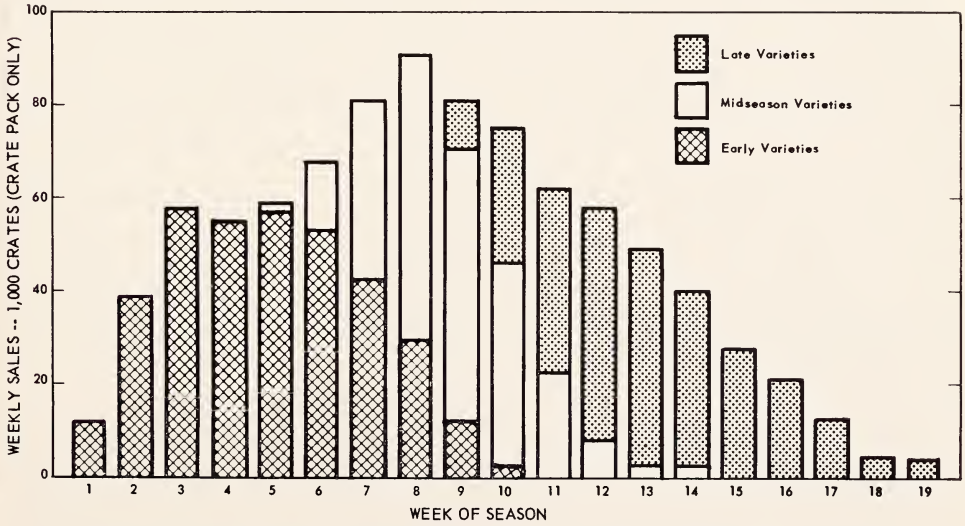


FIGURE 13. WEEKLY NEW YORK AUCTION SALES, BY VARIETAL GROUPS, 1955–58 AVERAGE.

Table 11. Grower Returns and Yield for California Plums

Year	Per ton	Per acre	Yield
	Dollars	Dollars	Tons
1951	109	437	4.1
1952	208	491	2.4
1953	123	432	3.8
1954	140	428	3.2
1955	135	538	4.1
1956	107	477	4.6
1957	164	573	3.6
1958	163	467	2.9
1959	116	480	4.3

This influence becomes weaker as the season advances.

¶ Auction prices increase (other factors remaining constant) when supply of plums decreases.

¶ Current prices are affected by sales made earlier in the season as well by current marketings.

¶ Plum prices are influenced, though not greatly, by supplies of other fruits, especially those marketed about the same time. For example, an increase of early peaches (from the southern states) will depress auction prices for midseason plums.

¶ Plum size does not materially affect the price. One size may be substituted for another without much influence on price.

¶ Price is considerably more responsive to changes in sales during the peak of the season than earlier or later.

FARM PRICES—EXPLORATION OF PAST MOVEMENTS

Farm prices may be quoted for fruit sold at the orchard, for fruit delivered by the grower to a packing house or processing plant, for fruit sold at auction by the grower, etc. Such prices are payments for fruit plus a varying amount of "added service." They need to be reduced to equivalents at a single point of the distribution route. Then prices can be compared for the farmer's job of producing fruit during different years and for different outlets.

The term "farm prices" as used throughout this circular refers to price equivalents for "naked fruit at the first delivery point." Such prices have been collected annually since 1909 for plums sold in each utilization outlet and for "all uses."

Equivalent per-acre returns to growers may give a better indication of how changes in yield affect the farmer's income, from which production and harvest costs must be paid. Generally, price fluctuations are inversely related to changes in yield and, hence, annual variations in per-acre returns are considerably less than price changes. For example, during 1951–58, a typical period, prices varied proportionately twice as much as per-acre returns (see table 11).

General Level

Fluctuations in prices received by California plum producers are due primarily to changes in consumer purchasing power and in production. Both factors have varied widely over the past several decades. Prices ranged from a low of $19

per ton received in 1932 at the depth of the depression to a record high of $208 for a small crop in 1952 when purchasing power was high.

The cyclical movement in average prices results chiefly from corresponding changes in consumer purchasing power. Prior to about 1930, consumer demand for fruits and vegetables generally was rising and extremely low farm prices prevailed only when bumper crops were produced and marketed. The situation was changed drastically by 1930, when a serious divergence arose between the supply of and the demand for most agricultural products. In the case of plums, the farm price dropped steeply from $72 per ton in 1927–29 to an average of $25 for 1931–33. Prices increased, but only gradually, during the next decade, to $50 per ton in 1941, and then rose sharply to an average of $140 maintained since 1950.

Price changes on a year-to-year basis arise from annual variations in production, i.e., yield. Such changes have been substantial. For example, during the past sixteen years (when the price averaged $123 per ton) the price changed, from one season to the next, by $70 to $99 in four years, by $38 to $57 in four other years, and by $1 to $28 in eight. When production goes up, prices decline; when production goes down, prices rise. For these sixteen years about half the annual fluctuation in farm prices can be explained by yearly variations in production. In statistical terms this inverse relationship is expressed by the coefficient of determination, $r^2 = 0.49$.

Farm Prices by Varieties

Farm prices of plums are not compiled on a varietal basis. A good indication of relative farm prices for different varieties can be secured by subtracting marketing changes from auction prices and by making adjustments for variations in the net contents of the crate container. This information is not presented here since the general relationships are apparent from the discussion of auction marketings given above.

Farm Prices by Outlets

Farm prices are substantially higher for plums shipped to fresh markets than for those sold to processors. Relative prices for sales in different outlets have changed significantly over the years. The

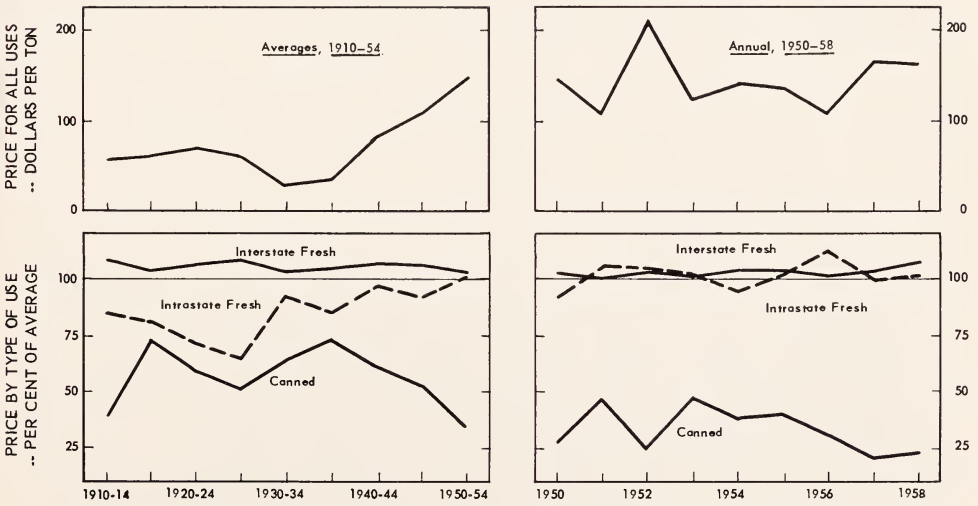


FIGURE 14. GROWER PRICES BY TYPE OF UTILIZATION.

general relationships among the several prices for the period since 1910 are shown in figure 14.

Prices for fresh intrastate sales averaged 25 to 30 per cent below farm prices realized from plums shipped to out-of-state markets during 1910–29 and about 10 to 15 per cent lower for 1930–49. This price differential has been small (2 per cent) since 1950. Apparently the issuance of similar regulations under federal and state marketing orders served to eliminate substantial differences in the grade-size composition of plums sold locally and shipped from the state.

Processors pay considerably lower prices. The cannery price usually averaged 50 to 75 per cent of the fresh price until the late 1940's. During the past decade it was at a level of only 30 per cent. Still lower prices prevail for plums otherwise processed. During the war period (1943–46) prices for plums frozen and crushed were 80 and 30 per cent, respectively, of the cannery price. Since 1953, the farm price for plums frozen averaged half the canning price—i.e., only 15 per cent of the price received on plums sold fresh.

Future Returns

If production expands in the pattern indicated, the volume of plums available for interstate shipment will increase and will have a depressing effect upon prices at terminal markets. The future course of consumer purchasing power, the other principal determinant of price, cannot be forecast, even in terms of a rough estimate, with any degree of confidence. In the event that it continues to climb at or near the recent rate, plum prices at consumer markets may be maintained or even raised above their present level.

Costs incurred for marketing services must also be considered when discussing returns to growers. These charges are substantial and fairly rigid. For example, during the past decade about half of the wholesale price at terminal markets was required to cover marketing charges and half was returned to growers—to pay for their expenses of producing and harvesting plums. When terminal market prices decrease for a given season, returns to farmers are depressed at a more rapid rate because marketing charges decline very little, if at all.

On balance, therefore, it appears that farm prices will not be depressed unduly provided the economy continues its present growth. During occasional years of bumper crops, however, returns to growers will decline to relatively low levels, as they have done during the past few decades.

The tables and figures used in this circular are summaries of more detailed information appearing in "Mimeographed Report No. 222," published in October 1959. This report gives sources in detail and may be obtained by writing to the Giannini Foundation of Agricultural Economics, University of California at Berkeley or at Davis.

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Careers Available

DAVIS.—"Jobs we can't fill; that's our graduation story every year," says Warren P. Tufts, chairman of the Department of Pomology on the Davis campus of the University of California.

"The demand for good personnel is not surprising when you consider that California produces about one-half of all the fruits in the United States. The fruit industry will always be important in this state, because of its favorable climate and soils and the great variety of crops. Trained people are always wanted in the fruit and allied industries—in growing, fertilizer and spray chemicals, inspection service, canning, quick freezing, and shipping.

"At all times, the Department of Pomology has standing requests for promising personnel, with the promise of several firms to make openings for recommended students if no openings already exist. Some year we hope we'll be able to supply the demand."

Pomology today

A knowledge of fruits and fruit-growing offers many fine careers. And the best positions go to those who have mastered the subject through a balanced program of training.

At Davis the course in pomology is balanced between practice and theory—the "how" and the "why"—using the finest facilities . . . taught by one of the largest and best-trained horticultural staffs in the world.

The Department of Pomology maintains about 300 acres of orchards, containing nearly all the important varieties of deciduous tree fruits, nuts, olives, and berries (strawberries, boysenberries, etc.). The student has an opportunity to become acquainted with most of the fruit-grower's techniques of production and marketing. He becomes familiar with the best and most modern orchard equipment.

For study and research, facilities also include a packing house, complete sun-drying and dehydration equipment, a cold-storage plant, lath-houses and greenhouses, and laboratories equipped with apparatus for fundamental studies.

The staff of the department includes specialists in fruit breeding, pruning, pollination, spraying, irrigation, fertilization and plant nutrition, soil management, physiological plant diseases, propagation, varieties, harvesting, handling, and storage of fruits and nuts.

Trained people are in demand for . . .

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